SAN DIEGO BAY COUNCIL

A coalition of San Diego environmental organizations dedicated to protection and restoration of San Diego's coastal water resources.

August 18, 2004

Chairman John Minan and Regional Board Members
California Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, California 92123-4340

RE: San Diego Bay Council Comments on Tentative Order No. R9-2004-0154 for Duke Energy South Bay, LLC, South Bay Power Plant

Dear Chairman Minan and Boardmembers:

San Diego Bay Council ("Bay Council") and its member organizations: Environmental Health Coalition; San Diego Baykeeper; The Surfrider Foundation, San Diego Chapter; San Diego Audubon Society; Sierra Club, San Diego Chapter; and, Southwest Wetlands Interpretive Association, are writing to submit our additional comments on Tentative Order R9-2004-0154.

Although Bay Council is encouraged to hear that the Board intends to take decisive action to adopt a Tentative Order in the immediate future, we are concerned by Duke's testimony regarding their intention not to make any structural or technological changes to the South Bay Power Plant ("SBPP") in order to comply with applicable laws. Duke's assertion is based on their belief that the plant may be closed in 2009, thus rendering any technological upgrades or changes as economically infeasible. However, as the testimony of Mr. Larry Tobias from Cal-ISO demonstrated, there is a strong possibility that Reliability Must-Run ("RMR") status may still be required for SBPP beyond 2009 due to the lack of new energy development and skyrocketing energy demand in the region. If SBPP still retains its RMR status beyond 2009, it could continue to run indefinitely. As a result, the Board should set limitations to the plant's operations that will ensure its compliance with the law. A fully protective permit cannot be based on whether Duke thinks that any changes needed for the plant are worth their investment.

Bay Council strongly believes that it is the duty of this Board to ensure that dischargers comply with the law. In addition, we believe that Duke has an obligation to pay for the true cost of operating the SBPP in compliance with the law. The Bay should no longer subsidize Duke's pollution.

I. Comments on Proposed Copper Effluent Limitations

Bay Council agrees with the Board's conclusion that the California Toxic Rule's (CTR) effluent limitations are applicable for the SBPP. As testimony has indicated, copper is a major problem in the San Diego Bay and SBPP contributes as much as 700 pounds per year of copper into the South Bay. Although Duke argues that much of the copper in their discharge is due to existing copper in the Bay, Duke is still legally responsible for meeting the CTR requirements. To resolve the larger issue, the Board must allocate copper loads to reduce overall copper levels in the Bay.

A. The dissolved copper concentrations in the receiving water stations measured in the CTR study exceed the CTR levels.

Figure 1
Copper Concentration in South Bay
CTR Data Measured 4/30/03, 5/15/03, 6/17/03

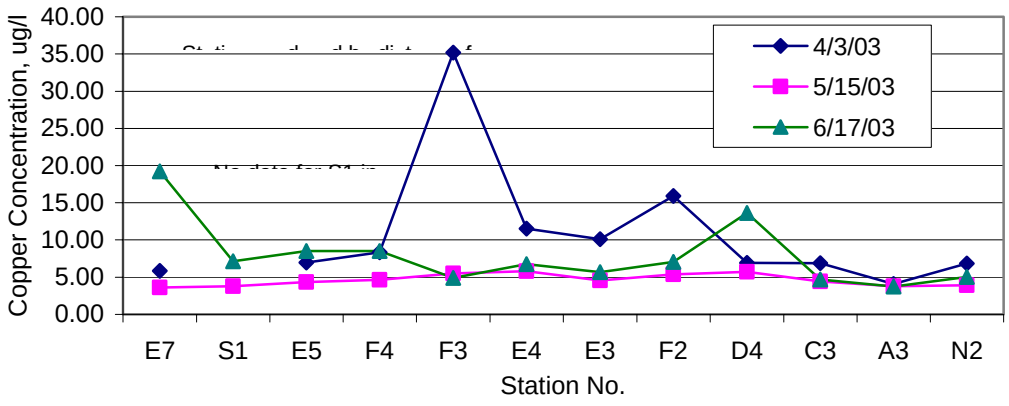


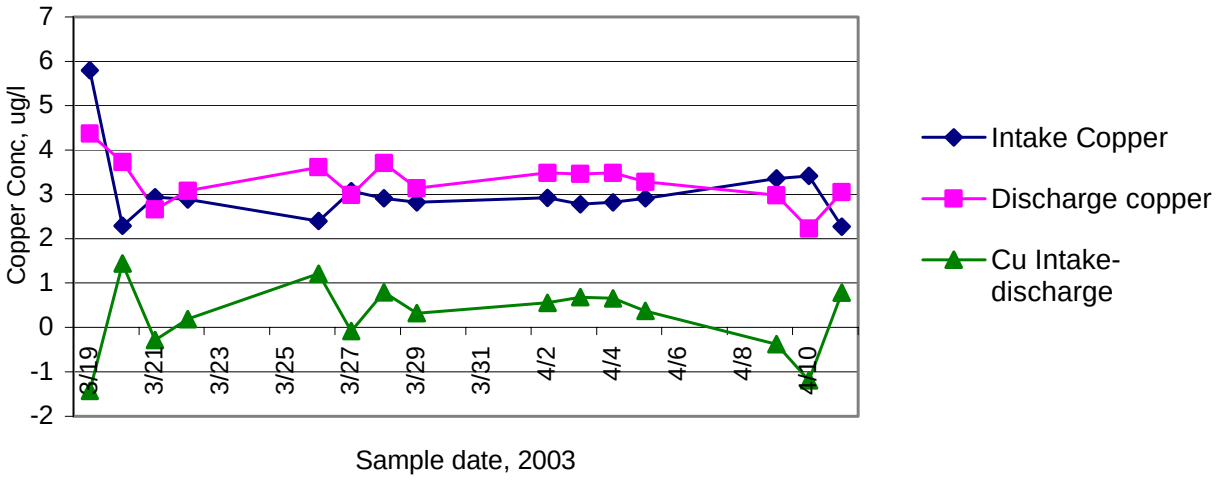
Figure 1 uses Duke's CTR data and shows copper concentrations at the receiving stations. The receiving water stations are ordered along the X-axis according to the distance from the discharge point. The lowest value is 3.63 µg/L. The data were taken at three dates in

2003. Note that at the stations farthest from the discharge point, C3, A3, and N2 do not vary much with the sample dates. The variation of May 15 samples were low compared to the other two sample dates, but these dates represent moderate load conditions of the plant's operation. Because the copper discharge from the power plant condensers varies with the power plant load, cooling water temperature, and flow rate, the copper that is discharged during these months is less than during the late summer months when the power plant loads are at a maximum.

B. Duke's CTR data demonstrates that the SBPP is contributing copper loading into the South Bay.

The CTR data has measurements of the copper concentrations at the intake and discharge points. The difference between the discharge and intake copper concentration gives a measure of the copper being eroded from the condensers. 15 samples were taken on consecutive days from March 19- March 29, April 2- April 5 and April 9- April 11. Figure 2 (below) displays this information.

Figure 2
Copper Concentration at Intake and Discharge
CTR Data



The CTR data also has copper concentration measured at the intake location. This data provided six 4-day averages ranging from 2.63 to 3.48 µg/L. So even at this intake location the copper concentration fails to meet the draft EPA criteria. Note that there are 5 occasions

when the discharge concentration was less than the intake. This may or may not be an artifact of the measuring method. One explanation is that the copper could be discharged in a somewhat discontinuous fashion. The average difference between the discharge and intake copper concentration is 0.20 µg/L. If the negative difference values are removed the average increases to 0.62 µg/L. These data were taken during the spring when the power demands are not at the maximum compared to the summer months. The copper discharge would be greater during the summer due to the higher discharge flows and water temperatures. . In its August 18, 2004 letter to the RWQCB, Duke cites copper emissions of 0.39 µg/L resulting from the copper emission study required by Order 95-05.

C. Methods available to ensure compliance with the CTR

1. Source Control of Copper Emissions By Upgrading the Condensers

The only way that SBPP can fully comply with CTR's copper effluent limitations is by upgrading the condensers. One of the major problems of using copper alloy tubing in the steam condensers currently is that they are prone to erosion/corrosion. The TO lists the types of cooling condensers used in the power plant. Unit 1 condenser material is stainless steel- Al6X containing chromium, molybdenum, and nickel. Unit 2 condenser material is an aluminum brass alloy with copper the major element then zinc with lesser amounts and only a small percentage of aluminum. Units 3 and 4 condensers use copper–nickel alloy. The Duke 316(b) reports that condenser in Unit 2 is also made from copper-nickel, contradicting the TO. The staff should be directed to provide for each unit the percent copper and other metals used in the alloys and the age of the condensers and their replacement schedules. Determine the availability of replacement condensers with superior properties including thermal and erosion resistance that can significantly reduce the discharge of copper and other toxic metals in the alloys into the Bay. If so, propose a course of action to replace the condensers.

The current trend for alternative tubing in condensers favors the use of titanium over copper based alloys. Titanium is more resistant to erosion. While titanium does not conduct heat as well as copper, steam condensers using titanium tubing can be designed to have equal or better thermal properties than those

using copper alloys. Examples of the titanium condensers are provided in the footnotes.[1]

II. Comments on Compliance Point and Flow Measurement Method

Bay Council agrees with the Board's legal conclusion that the legal compliance point for measuring the effluent requirement is at the "end of pipe". Staff raised the issue that the measuring flow at the physical end of the pipe would not provide an accurate value of the flow because water at this location is turbulent and is mixed with air. In our comments to the Duke Studies, Bay Council asked Duke to explain how they determined the effluent flow volumes reported in the 316(b) report. Duke's answer was that it used intake pump "name plate" pump flow ratings and the data log showing the operating time of each pump. So, it is not clear if this has been the way flow and flow volume have been measured in the past.

The Board should require that flow meters be located in the discharge pipes. Tests should be conducted to determine the minimum distance from the end of the pipe to locate the flow meter to provide accurate flows. Various types of in-pipe flow meters are available.[2] An effluent sampling line could also be located near flow metering point if it proves that the end of pipe samples can give erroneous results. Given accurate flow and effluent contaminant measurements the mass emissions for each discharge pipe can then be combined to provide the total flow, concentration and mass emission for each contaminant of concern. Effluent temperature of the total discharge can be determined from the mass flow and temperature for each discharge pipe on a mass weighted basis. Bay Council recommends this analysis be done, as pipe flow measurements provide more accurate discharge flows than measuring flow at the property line (channel flow). Channel flow measurements must accurately know the channel cross sectional area and velocity. These parameters are difficult to determine because the channel cross

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[1] Titanium Metals Corp Application and Design Trends. Discusses titanium tubing for surface condensers. Notes increasing number of power plants re-tubing condensers with titanium tubing (http://www.timet.com/cod-p26.htm); Babcock Power, Inc. Technical Paper Modular Condenser Replacement at ANO-1 Solves Operating Problems and Improve Performance, Jan 01, 1999. (http://www.babcockpower.com/index.php?option=techpapers&task=viewtechpaper&techid=89.)

[2] See: http://sensors-transducers.globalspec.com/Industrial-Directory/pipe_flow_meter (last checked on 9/15/04).

sectional area varies with the tide, changes in bottom and side profiles over time.

A. Acute toxicity should be assessed at the maximum discharge temperatures.

The acute toxicity tests currently are conducted with the effluent at nominal room temperatures. However, the test species used are invertebrates, which are ectothermic (as are the fishes, plants and all other life forms in the bay except marine mammals and birds). The body temperature of ectotherms depends on the surrounding temperature. Their metabolic rate increases with temperature[3], doubling for every 10 degrees Celsius. This means that respiration and oxygen demand increases while the dissolved oxygen in the water reduces with temperature. The toxicity of copper, lead and zinc increase with temperature[4]. Consequently, the acute toxicity results reported on page 14 of the Tentative Order showing % survival rates from 85% to 100% may be optimistic. We restate our request that special toxicity tests be conducted at the maximum recorded effluent temperatures to more accurately reflect true conditions in the Bay.

III. Comments on Temperature Limits for SBPP at Compliance Point

At the public hearing, Staff noted that it needed guidance from the Board as to what temperature limits to set for the SBPP that would protect beneficial uses. In our Comment letter (dated August 18th, 2004), we recommended significant changes to the Tentative Order's effluent temperature limitation. We recommended actual monthly maximum temperature limits, as opposed to a delta temperature limit, in order to protect beneficial uses.

These recommendations were based on the report prepared for San Diego Bay Council by Richard F. Ford Ph.D. and entitled *Recommended Options for Maximum Water Temperature Limits and Minimum Dissolved Oxygen Limits at a Compliance Point for Discharges From the South Bay Power Plant in San Diego Bay,*

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[3] http://www.users.nac.net/jmele/TPAL.html Joseph A. Mele, "Thermal Pollution and Aquatic Life"

[4] http://journals.tubitak.gov.tr/zoology/issues/zoo-00-24-4/zoo-24-4-9-9909-2.pdf Levent BAT et al, "The Effect of Temperature on the Toxicity of Zinc, Copper and Lead on the Freshwater Amphipod *Gammarus pulex pulex* (L., 1758)"

Necessary to Protect Beneficial Uses.[5] Dr. Ford bases his recommendations not only on several of the CWA Section 316(a) studies cited in the Tentative Order Fact Sheet, but also what temperature limit would be appropriate to fully protect beneficial uses. He based his recommendation on information from species-specific laboratory and field studies concerning temperature tolerances of marine invertebrates and fish species that inhabit the inner Bay. These studies combined laboratory and field data conducted to determine temperature tolerances and preferences of four major species of larger marine animals that are important members of the bottom communities in South San Diego Bay. These are the suspension feeding bivalve mollusks *Solen rosaceus* (rosy razor or pencil clam) and *Tagelus californianus* (California jackknife clam), the filter feeding bivalve *Chione fluctifraga* (smooth cockle), and *Paralichthys californicus* (California halibut). Studies on the rosy razor and jackknife clams found the following:

- Population densities of the rosy razor clam and jackknife clam were lower than in the control station located beyond the thermal plume.

- The jackknife clams in the discharge channel had higher growth rates but smaller size than those of individuals living beyond the discharge channel, indicating adverse effects of elevated temperature.

- Annual mortality rates of the rosy razor clam were higher within the inner thermal plume.

- Life history traits of the rosy razor and jackknife clams differed between the control and thermal plume station locations because of elevated temperature. They displayed variable reproductive effort, fewer young, and shorter life span compared to those in the control location.

Another study on the effects of elevated temperature on the smooth cockle revealed similar results:

- Accelerated growth rates in both summer and winter. Accelerated growth rate in winter was unusual as this is the period when growth rate is reduced in the natural population. This clearly indicates an adverse effect.

[5] *See* Ford DO Study, Attachment B

- Long-term mortality rates were significantly higher and may include basic metabolic disturbance, as indicated by loss of tissue weight.

- Laboratory tests observed decreased burrowing rate compared to normal activity patterns. During elevated temperature conditions, the decreased burrowing activity in the discharge channel would result in increased predation. Observers noted numerous fresh shell fragments in the sediment and fecal material from unidentified shore birds on the sediment surface in mudflats bordering the discharge channel. They found less shell fragments on the Sweetwater mudflats that are located well beyond the thermal influence of the power plant suggesting a lower level of predation.

Laboratory studies on the water temperature preference of the California halibut revealed that about 50% of juveniles displayed an avoidance behavior to elevated temperatures. Dr. Ford notes that this behavior may be of ecological concern as it reduces their food foraging area. Furthermore, the absence of their predatory feeding activity within the elevated temperature areas may cause unnatural changes in the prey population within this region.

Dr. Ford concluded that the laboratory and field studies of these four important species help to explain the results of the general ecological field monitoring studied of 1968-1994. These specific studies have identified more subtle and important adverse effects on growth, reproduction, burrowing activity and behavioral responses of the test species when exposed to high temperatures in different locations of the inner and outer thermal plume. He states that results of these important species-specific studies must be considered in establishing the temperature at the compliance point that truly protect the beneficial uses of inner San Diego Bay.

A. Adopt Dr. Ford's Recommended Temperature Limits to Protect Beneficial Uses

Dr. Ford provided several options for limits on temperature that would allow the SBPP to protect beneficial uses. Bay Council has selected Dr. Ford's most stringent option for temperature criteria in the receiving waters, as it is the most protective of beneficial uses. The criteria are set for each month of the year rather than one set for

the entire year. The data were determined from six full calendar years 1997 -2002 measured and reported to the San Diego RWQCB by MEC Analytical Systems, Inc., Carlsbad, California. The measurements were taken at Station N2. Water temperature measurements were made at 2-foot depth intervals in the water column from near surface to just above the bottom for each date. All data were pooled for each month. Table 1 below lists the monthly maximum discharge temperature as measured at the compliance point S2*.

Table 1

Recommended Maximum Cooling Water Discharge Temperature Limits

Month	Max. Temp. Deg F
January	**62**
February	**62**
March	**67**
April	**68**
May	**72**
June	**76**
July	**78**
August	**80**
September	**78**
October	**73**
November	**68**
December	**67**

* In should be noted that compliance point used in the Ford report has now been revised to S2.

In order to assess the impact of the cooling water effluent, we concur with Dr. Ford's recommendation that a seasonal (quarterly) marine ecological monitoring program be conducted. This should include taking and analyzing the invertebrate infauna, employing a minimum of five replicate, 0.1 sq. m Van Veen grab samples at a series of stations within and outside the extent of the thermal plume including Stations F3 and N2. The invertebrate infauna samples shall be analyzed using the methods of the Ford and Chambers 1972-73

study[6] and summarized per the E.A. Engineering, Science, and Technology 1995 report [7].

IV. Comments on Relevance of the National Wildlife Refuge on SBPP Permitting

During the public hearing, Board members raised concerns on the presence of the National Wildlife Refuge and its planned expansion in the near future. Bay Council recommends that the Board contact U.S. Fish and Wildlife to resolve the issue of whether the expansion of the NWR will impact the permit for SBPP.

Nevertheless, Bay Council believes that the presence of the NWR does not in any way change Duke's requirements and obligation to comply with applicable laws. Moreover, the presence of the NWR heightens the importance of adopting a permit that is truly protective of water quality and beneficial uses. The NWR is a sensitive critical habitat for a large density of wildlife such as the endangered least tern, gull billed tern, and pelicans. All the wildlife forage in the area and depend on fish for food. In addition, there is a great potential for future, current, and ongoing restoration projects to improve and restore the remaining wetlands, mudflats and eel grass beds that the bay's thousands of migrating and resident shorebirds and waterfowl will depend on for their long-term survival.

V. Adoption of a Cease and Desist Order

Bay Council request the Board adopt a Cease and Desist Order ("CDO") into this Tentative Order. A CDO is an appropriate tool the Board can use to provide a time schedule to achieve full compliance for a discharger who cannot immediately comply with permit requirements. In the case of the copper CTR limits, a CDO would ensure that Duke will be allowed to continue to operate even though they cannot be in immediate compliance with its permit requirements, while setting a time schedule with achievable benchmarks to ensure compliance and imposing appropriate penalties if compliance is not attained.

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[6] Ford and Chambers, *Thermal Distribution and Biological Studies for the South Bay Power Plant*, May 1973

[7] E.A. Engineering, Science, and Technology. (EAEST*), South Bay Power Plant Receiving Water Monitoring Program with Emphasis on the Benthic Invertebrate Community (1977-1994).* 1995

VI. Conclusion

Bay Council requests that the Board follow-through with its obligation to protect water quality and beneficial uses in the Bay by adopting the following for the SBPP:

- Set a compliance schedule that includes a Cease and Desist Order;
- Require that Duke upgrade their condensers to comply with CTR limits for copper; and
- Set monthly maximum temperature limits that protect beneficial uses

If the above conditions are adopted, Bay Council could support the Tentative Order as it would be protective of water quality and beneficial uses.

Sincerely,

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